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Spin wave modes in ferromagnetic nano-disks, their excitation via ac currents and fields, and auto-oscillations[1] RODRIGO ARIAS, DANIELA MANCILLA, Departamento de Fisica, FCFM, Universidad de Chile — The excitation with spin polarised dc-ac currents of the linear spin wave modes of a soft ferromagnetic free layer of a nano-pillar structure is studied. These structures may be used as microwave sources when these nano-oscillators enter into auto-oscillatory regimes. The free layer is a soft ferromagnet, in the shape of a circular disk, with a very small thickness. Using a description of the magnetization dynamics in terms of a Hamiltonian for weakly interacting waves we determine the spin wave modes of the structure under two approximations: a very thin film limit, and a model with the full dipolar interaction. We consider direct and parametric excitations of different spin wave modes, i.e. when the exciting ac frequency is approximately equal to the frequency of the mode or to twice its value, respectively. The Oersted field mainly plays a role in the direct excitation of the modes. Our main conclusion is that for a dc current below the critical value necessary for the development of auto-oscillations, a very high value of the ac current is needed in order to reach the auto-oscillatory behaviour using parametric excitation. But if the out of plane component of the spin transfer torque is high enough, the ac critical current for auto-oscillations is significantly reduced.

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